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SOME CONSIDERATIONS ON THE NOTION OF SPACE.

BY J. E. CABOT.

All bodies are extended, or exist in Space — that is, they are outside of us, and outside of each other; and this *outness* we imagine indefinitely prolonged in all directions — as indefinite *room* for others. Yet, although Extension is the most general character of bodies, when we ask ourselves what it is, we find only negative predicates; it is pure indifference to every one of the sensible qualities; they may all be changed without touching the extension of the body; and we can at last only define this extension as the *otherness*, the mutual externality, of the parts.

How, then, do we get any knowledge of it; or to what possible impressions does it correspond?

It is natural to us to say that we *see* the place, distance, direction, and extent of bodies — that the separateness of the letters on this page, for example, is visible, just as the black color of the ink and the whiteness of the paper are visible. This was the prevalent opinion before Berkeley, and many psychologists seem to be returning to it.[1] Evidently, however, this is a figurative way of speaking; for it is not meant, I suppose, that Extension is an affection of the optic nerve; in other words, that it is a color. If this *is* meant, then we are entitle to ask, What color? Some one, I forget who, has suggested that Space is of a bluish tint; Mr. Riehl considers it to be a consciousness of black and white, or of light and shade. If these hypotheses are to be taken in earnest, they require us to suppose the existence, as a physical fact, of an indefinite *substratum* as a ground-work upon which all particular colors are spread out, and as the condition of their being perceived. This, I think, is too much like the old notion of a Substance without attributes, existing merely as the subject of attributes, to find favor with scientific men.

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[1] *E. g.*, Stumpf: "Ueb. d. psychische Urspr. d. Raumvorstellung." Leipzig, 1873. Riehl: Viertheiljahrsch. f. wissensch. Phil., 1877, 2tes H., p. 215.

No visual impression of any kind can be the condition of our perception of Space, for blind persons in whose experience this condition is wanting have this perception. Indeed, if Space be a sensation, it is one that is common evidently to several of our senses — probably in some measure to all. Many animals hunt principally by scent, and blind persons discriminate position and distance with great accuracy by hearing alone. M. Delbœuf[2] considers our association of Space with sight and touch to be merely a matter of habit, connected with the superior development of particular organs in the human race, and thinks that we can easily imagine a nose or an ear that should *see* Extension as truly as our eyes *see* it. A nose or an ear differentiated to the same extent with our eyes, viz., having upon the sensitive surface one spot of intenser sensibility, provided with a refracting medium capable of presenting a wide field of sound or scent, and with a movable tube permitting the field to be freely explored in all directions — would, we can hardly doubt, be able to discriminate positions in Space, if not as well, yet as really, and in substantially the same way, with our eyes or hands. On the other hand, an eye reduced to the same conditions with our nose or ear would possess as little power of discrimination.

Is Space, then, an occult quality in bodies, which modifies our apprehension of them without our being able to identify it with any nervous affection, or in any way to demonstrate its presence apart from the inferences to which it gives rise? Science is jealous of occult qualities, and rightly, for it is an hypothesis very hard to control. No doubt we have a sense of Extension—just as we have a sense of right and wrong; but to allege this sense only states the problem, without any attempt to solve it.

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[2] Psychologie comme science naturelle. See, also, Rév. Philos., 1876, p. 745.

On reflection, it is evident, I think, that no simple feeling of any kind can be conceived as giving us by itself the impression of Extent; we cannot suppose it constituting a surface, or consisting of parts arranged above or below, or on the right or left hand of each other. Our feelings are by their very nature internal; occupy no room, and exist, as Hume said, *nowhere* but only in being felt. Nor can any assemblage of these zeroes give us what they do not themselves contain.

Evidently the extension of a body is not a quality, like weight, color, odor, etc., belonging to each part of it independently of the rest, but resides wholly in the relative position of the parts, of whatever nature they may happen to be. Hence it is that the particular character of the impressions makes no difference in their extent. Seen Extension is the very same thing with that which is felt, heard, or smelt, and in all these cases it is equally distinct from the sensations with which it is associated. A sound or a smell is localized, not as definitely perhaps, yet as really, as a color or a touch; and in all alike the situation is a fact of a different order from the nervous affection.

Assuming, then, that Extension is not a sensible quality, but a relation which may subsist among impressions of any quality, or, at any rate, of various qualities, the next question is how we become aware of it. The only grounds of relation between our various sensations are resemblance, and sequence in Time. Affections of the same organ are more or less like each other: every taste is a taste, every sound a sound, and even black and white are alike colors, however they differ within this limit. Affections of different organs are neither like nor unlike; and, finally, all our sensations are related in the time of their occurrence, as being either before, after, or simultaneous with some other.

Such being the materials with which Experience has to work, it is natural to look to successiveness in time as the experience originally corresponding to the outward fact of a diversity of parts; and, on the other hand, to the similarity of like sensations as giving us the impression of continuity or juxtaposition.

Accordingly, many psychologists have traced the notion of Extension to the compound impression of a series of feelings so closely associated with a single feeling as to become identified with it—*e. g.*, if I move my hand back and forth with different degrees of rapidity, I get a series of impressions (of points successively touched, varying pressures upon the tissues, successive muscular efforts, etc.), succeeding each other at different rates, and thus conveying the impression of mere distance or extent. Then, if the motion be interrupted by contact with a resisting object (as, where different parts of the same thing are successively touched, or the hand is passed across a smooth, hard surface) — or, if the consciousness of it is interrupted by the consciousness of accompanying muscular effort, the amount of which remains the same whatever the rate of movement may be — the diversity of successive feelings is changed, by association with the feeling that remains the same, into the complex image of a diversity of parts in one object. The order of the impressions is, in the first place, detached from their particular sequence, and then, by a further step, it is apprehended as a diversity which is, also, from another point of view, identity, and these are associated together as one fact.

To this theory, in the form in which it was propounded by Dr. Thos. Brown, Sir Wm. Hamilton objected that the diverseness or remoteness here spoken of is remoteness in Time, not in Space; and he might have added—perhaps he did—if it were to become obliterated, the result would be, not that we should become conscious of objects in Space, but that we should cease to be conscious of events in Time.

Mr. J. S. Mill, in his Examination of Hamilton's Philosophy, rejects this criticism rather roughly, with the *argumentum baculinum* that, whatever our notion of length in Space may be, it is, as a matter of fact, constructed by the mind's laws, out of the notion of length in Time. What those laws of the mind are, that can give us the notion of a *synchronous succession*, he does not explain, but it is safe to say that this is not the notion of Space. The obliviscence of Duration is a phenomenon that is familiar to us in all our habitual actions, and we find nothing of the kind in it. Any set of complicated movements often repeated comes to seem like one; a practiced player upon the piano-forte, *e. g.*, comes to regard the successive adjustment of his hands, etc., as a single act; but there is no appearance here of a construction of Space.

Whatever plausibility belongs to any of the various attempts that have been made to evolve Extension from purely intensive feelings, with the help of the consciousness of movement, is due to the fact that, in assuming this consciousness, they assume the whole of their case. The movement must start from some point, and this point is already spacial. Now, if we may look upon our sensations as things existing outside of us at particular distances in definite directions, there is no further difficulty in the matter. But just this is our question: How they can have any *place* except in our consciousness — or how we come to imagine that they have any other? It seems impossible that a purely sentient being, having no knowledge of Extension, should ever arrive at such a notion.

Let us suppose the case of such a being, and, in order to cut off the associations with Extension that so obstinately cling to our visual sensations, let us further suppose that he is blind, but that his sense of hearing is so developed as to present to him a wide auditory field in which he can discriminate particular sounds with great accuracy. Now, let us bring him into a concert-room where a large orchestra is playing, and seat him in the middle of the front row. He will at once single out (let us say) the violoncello, and he will be more or less dimly aware of the first and second violins on either side, and of the other instruments further off. Judging from analogy, we should say that he will probably, after a while, turn his ear first in one direction and then in another, so as to bring various instruments successively before him—just as we see a baby turn its eyes from one bright spot on the ceiling to another. In short, he will act just as if he knew that they are co-existing things at certain distances and in certain directions from him and from each other. But to conclude that he *has* such a knowledge seems to me an important step, and a step entirely in the air, for it is supposing him to reason in contradiction to his premises. He has every reason to believe that he has created the violoncello, and that he will successively create the violins and the other pieces, and annihilate them the next moment—just as he creates a sweet taste by putting a lump of sugar upon his tongue, and destroys it by tasting something else. All these facts are parts of him—of that series of feelings which he is—and it is utterly inconceivable that any association or combination of them, or such further facts as that certain of them occur now successively, and now all at once, should ever lead him to the contrary opinion, or to the belief that different parts of one object can be present at once, and yet be distinct from each other. How should similar sensations be distinguished except as present or not present? Shall we say that he has an innate capacity for distinguishing them as signs of different objects, which accordingly may exist even when they are not perceived? No doubt we are conscious of such a faculty in ourselves; but this consciousness no more explains this faculty than the *virtus dormitiva* explains the action of opium in putting us to sleep; it is only another statement of the fact. Evidently there is something that needs explanation in the claim to perceive as existing all at once something which is in reality successive. The only object that he knows of is the sensation he actually feels; the only *place* is place in a sequence of feelings, and this is indivisible and admits of no discrimination, and no relation of different things of the same kind, except between that which exists and that which does not exist. The presence of several feelings at once must mean the coincidence of affections of different organs; such as a smell, a taste, and the feeling of a smooth surface occurring at the same time with the sound to which he is listening. But these do not form parts of one whole, nor, whether they occur all at once or successively, is there any Space between them.

Of course our blind man will be free to admit the existence of certain general conditions, normally accompanying his particular sensations — that is to say, certain preliminary feelings generally announce to him that he is in a position to evoke a sweet taste, or the sound of the violoncello, etc. But the assertion that these conditions are *external* to him, and continue to exist whether they are felt or not; that, besides their quality as sensations, they have another quality as signs, in virtue of which they are *somewhere* all the time, ready to evoke similar sensations; or are capable of serving as fixed points, in relation to which the position of other sensations can be fixed, must seem to him a most violent paradox, and it would not be mitigated, so far as I can see, by the universal prevalence of such an opinion, or by any degree of regularity in the order of phenomena. How should he ever come to suppose that they are anything else than just what they appear to be?

In order to admit such a conclusion he must first have come, not merely to distrust his senses, but to the implicit assumption that their informations are of no value whatever; that their value lies in what they *prove*, not in what they are — in short, he must have begun to think, instead of merely to feel.

To think is to apprehend the universal relations of our particular and personal experiences; to discover what they signify, or what hypothesis they oblige us to adopt. If it be asked why we put ourselves to this trouble, why, instead of contentedly dwelling in our sensations, we at once go beyond them, try to account for them, and make them intelligible, the only answer is that we cannot help it; that such is our nature. A being like that above supposed, who makes no assumption as to the meaning of his impressions, draws no inferences from them, but just takes them as they are, is the abnormal man, the idiot. The normal man, at the first awakening of consciousness, finds himself with this presumption in his mind: that every one of his sensations is a sign, or has *some* necessary relation to the rest of the universe.

The first *naïve* expression of this discovery is given in the sense of Space — the indefinite *otherness*, the externality and mutual externality of all objects of perception. This is the first aspect of the conception of reality, and by contrast the negation of the reality of the present sensation.

It is impossible to antedate this experience, or to derive it from any simpler *data*. We can analyze it into its implied elements, but then we must not mistake these for facts of Experience, for we have no such experience.

In discussions of Space, as this notion presents itself to common-sense, we are apt to leave out of view this fundamental negation of immediate feeling, upon which it rests, and to take up the matter further on, where this indefinite otherness of the real world has become so familiar, and the presumption of it so instinctive that we are only vaguely conscious of it as a general background underlying all our perceptions. At the same time, it is so intimately associated with each one of them, and above all, of course, with the most familiar — viz., those of sight and touch — that we not unnaturally imagine it as something positive, and suppose that we *see* or *feel* Extension as if it were a general color or surface, distinct from all particular colors and surfaces, instead of being, as it is, not indeed the negation of color or resistance, but the negation of any reality in the sensible qualities taken by themselves.

But this vague image of the general relatedness of objects — if we treat it as if it were derived from experience, by merely leaving out of view the special qualities of our sensations, as visual, tactual, etc., and retaining their positions — dissolves as soon as we endeavor to realize it to our minds in a particular case; for it is, in truth, the picture of a relation without related terms. Our sensations, when we have abstracted from them their special qualities, are simply nothing at all, and cannot be brought into relations with each other or with anything else; and we have to fill out their empty forms with an occult quality of *localization*, which really signifies only the exigencies of our theory.

This is the position of the *local-sign* theory, proposed by

Lotze and adopted, with some modifications, by Helmholtz and by Wundt.[3] In this theory, Experience appears (though sometimes under protest) as a *logical* function, a process of interpretation and inference, and not as the simple reflex of a physical process. But, as it is still supposed that all knowledge of matters of fact or of sensible things must be derived immediately from Sensation, the question at once occurs, What is the sensation that informs us of the difference between (say) one edge of a sheet of white paper and the other edge? There is no difference in the sensations. The different positions of the retinal images? This is not a sensation, any more than the width of the sheet is a sensation; it is a physical fact, and our question is how this quantitative fact is derived from nervous affections, which admit of no differences except of quality and degree.

The local-sign theory has no answer to give to this question; it can only urge that there *must have been* a quality in our sensations, or in some of them, which informed us of the position of their objects — else we could never have come to distinguish one part of our body from the others. Lotze[4] conjectures that every impression that can be localized may consist of a fixed association of two elements: a physical process which gives rise to the consciousness of a particular quality (a color, a feeling of warmth, etc.), and a parallel process of unknown nature, perhaps connected with innervation feelings, which is the same for all kinds of impressions, but different for different parts of the body. We cannot tell, says Wundt, precisely in what these differences consist, because we only make use of them for the sake of localization; and apparently have forgotten what they were before we so used them. To such straits are scientific men reduced in their anxiety to avoid metaphysics.

It would be more scientific, I think, to state the fact just as we find it — viz., to say that these differences, so far as we know, do not *exist* until we use them; that the relation of Extension and its terms come into being together, in our perception of external objects; and that we have no knowledge of either of them apart from the other. A single object, alone in the universe, would be nowhere, and it would be unextended, until we conceived it as divided into parts, standing in relations to each other.

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[3] Grundzüge d. physiol. Psychologie, 478 f.

[4] Mikrokosmus I, 357.

In short, our case is that we have no discernment of things as they are by themselves, directly corresponding to our nervous affections, but only of phenomena — *i. e.*, of things determined and made what they are by the relations which the mind discovers in them; things as they must be thought, not things as they are felt. The object seen is not the impression on the retina, nor anything corresponding to it — for nothing can correspond to one affection of my nervous system except another affection of it — but such a thing "as must be present in order to produce, under the normal conditions of observation, these retinal images."[5] Or, rather, not *these*, for that is impossible, but images requiring the same interpretation. Accordingly, whatever presents the evidence requiring that interpretation presents the object, whether it is there or not. No reader, probably, sees in this page a blank space (or two blank spaces) "big enough to contain eleven full moons;" but the reason why everybody does not see it is that most persons see what is to them convincing proof that the page is full of letters, and, accordingly, supply the letters where they are wanting. A practiced observer, who has turned his attention to these matters, sees the *lacuna;* but, if he supposes that by any study or any perfection of apparatus he will ever come to see things "just as they are," without any interference of the mind, he is the victim of misplaced confidence in a metaphysical theory. He will only substitute new hypotheses for the old.

To wind up these somewhat cursory remarks: The notion of Space, like all our notions, and like the whole content of our experience, is the workmanship of the mind operating with *data* of which, because they lie below consciousness, we know nothing directly. If we call these *data* sensations, then it is clear that there is no sensation of Space as an objective fact, because there is no sensation of any *object* — because Sensation is its own object, and has no other. "There is something there," means something *else* than my sensation. If we say (as we may) that to be conscious of a feeling is to be conscious that it has relation to *something* beyond itself, then there is no objection to the position that we have a feeling, or a sense, of Space, which needs only to be clearly set before the mind and to have its implications made explicit, in order to become the notion of Space; only that, as it differs from those organic feelings which we commonly call sensations precisely in this, that it *can* be made more explicit — in other words, that we can discriminate those operations of the mind for which it stands — it becomes superfluous and misleading to insist on the fact that it is *also* a sensation. Superfluous because any of our experiences may take the form of sensations, if we dwell only on the personal impressions they make upon us; and misleading because saying this seems to say that they are nothing more — as if we were to say of a man that he is an animal.

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[5] Helmholtz: Populäre wissenschaftl. Vorträge, 2tes H., p. 91.

If, finally, it be asked, as it has been lately asked, whether the notion of Space, then, is a purely mental creation, or whether it corresponds to something independent of the mind, the answer is that this depends upon what we mean by the mind.

If we mean a consciousness of feelings, past and present, connected by the thread of memory, evidently such a sequence cannot create a system of necessary relations between its various parts — still less be conscious of them as all present at once. To such a consciousness spacial existence must appear as something altogether strange and incomprehensible — an ultimate fact, not to be reconciled with the other facts of experience. The feelings of an infant when first it begins to dawn upon him that there is something outside of himself we may conjecture to be of this sort. But there is no reason why we should endeavor to perpetuate this infantile state of mind.

If we mean Self-consciousness — the mind returning upon itself and its impressions, and qualifying these as true or false, real or unreal, through their rational interpretation as signs of something ulterior (which is our actual state) — we may say that Space is the creation of the mind, just as we may say that the sense or the notion of right or wrong is the creation of the mind — since nothing is right or wrong until somebody sees it to be so — without meaning that it is anything unreal, or admitting the possibility of a state of things in which these distinctions would not hold good.

BRUTE AND HUMAN INTELLECT.

BY WM. JAMES.

Every one who has owned a dog must, over and over again, have felt a strange sense of wonder that the animal, being as intelligent as he is, should not be vastly more so. His conditions would be easier to understand if he were either more universally stupid or more generally rational. The quickness with which he learns the signs which indicate that his master is going out, such as putting off slippers and putting on overcoat, seems incompatible with his utter inability to learn that dropping more coal into the grate will make a hotter fire. Accordingly, quite apart from theological and metaphysical prejudice, it is not surprising that men's opinions regarding the mental state of brutes should have oscillated between the two extremes of claiming for them, on the one hand, reasoning powers in no essential respect other than those of man, and, on the other, of denying to them all properly intellectual attributes whatever, and calling their powers of appropriate action the result of "instinct," or, still worse, of mere blind mechanism. Most of us adopt a medium course, and feel as if our domestic pets had real, though peculiarly limited, intellectual powers, and at various times attempts have been made to define exactly what this limitation consists in. It has been said that they were like men dreaming; that they could not form abstract ideas; that they had no proper self-consciousness; that they were incapable of apprehending the